Space Weather Forecast

Issued on Sunday, 06 March 2022 at 00:48 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of further G1/Minor Geomagnetic Storms initially. Daily Chance of R1 Minor Radio Blackouts throughout. CMEs pending assessment.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was low over the period, with occasional common-class flares observed. These flares peaked with a small but long-lasting flare at 05/2022UTC from a newly-developed sunspot region in the sun's northeastern quarter. This area was one of the suggested locations for increased flare activity as it crossed from the sun's far side late last week.

There are currently five sunspot regions on the sun including the aforementioned one, with the sunspot responsible for the moderate-class flare of 02 March also re-emerging - this is the source of the possible CME in the forecast during the upcoming UTC day of Sunday 06 March. A further sunspot faded in the southwestern quarter of the sun, leaving two further groups that dominate the facing side areally. These both showed a slight growth trend.

There are currently numerous 'filaments' (arcs of plasma) on the sun, and a good number of these have been mobile in the past 24 hours. Candidates undergoing assessment or monitoring for any Earth-bound Coronal Mass Ejection (CME) component follow below.

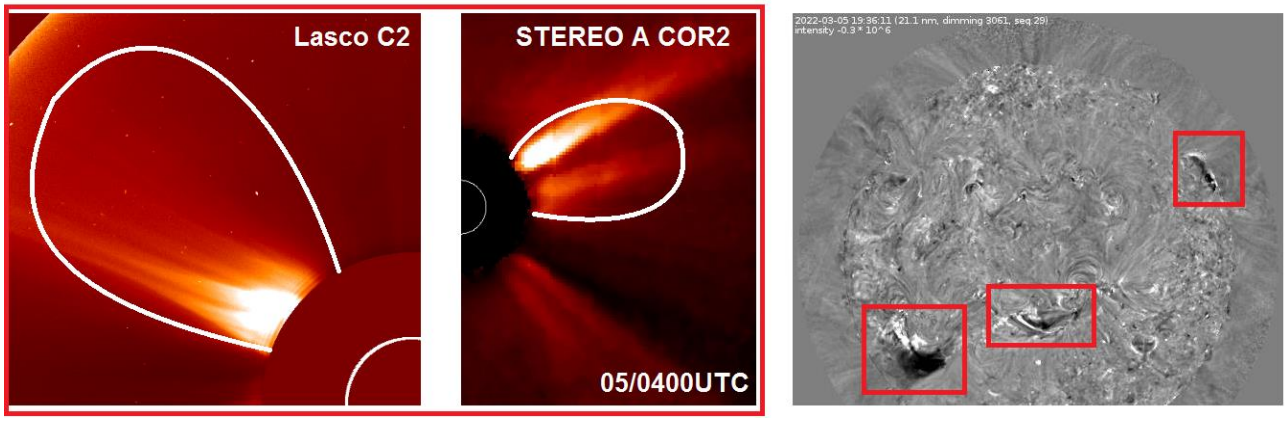

Figure 1: Rogues' gallery of CME candidates in the period: the left and centre images show a satellite imagery pair from 05/0400UTC showing a CME from an unidentified source seen leaving the northeast during the UTC morning of Saturday; the right image shows the three remaining candidates' trademark 'footprints' in extreme UV imagery (courtesy of SIDC ROB).

Firstly, a northeast-directed CME of uncertain origin, seen on satellite imagery into Saturday daytime hours UTC. This event is especially low confidence, and may result from misattribution of assumed matches between two triangulating satellites, however an Earth-bound component is

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possible if the assumptions prove correct. Modelling for this event is pending.

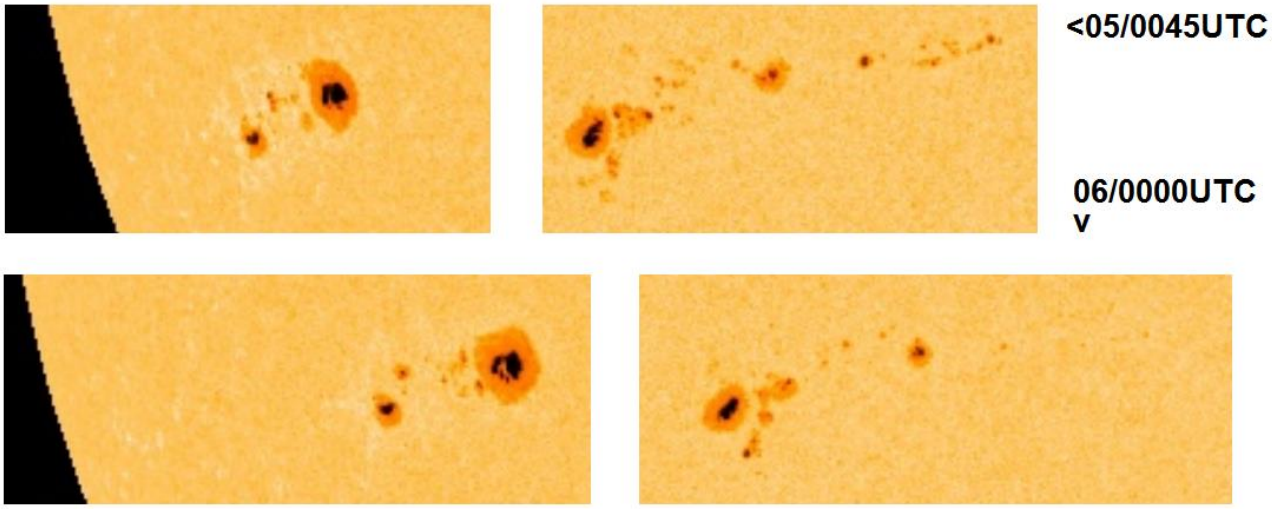
Secondly, a large 'disappearing filament' at 05/1530UTC near the centre of the sun. There is currently no evidence of any CME from this event, but it is being monitored, particularly given its central location.

Thirdly, a CME seen heading northwest from the northwestern solar horizon after 05/1720UTC. Modelling for this event is pending.

And finally a possible emission from the southeast at 05/1830UTC. There is again not yet any evidence of a CME from this final event.

At present then, the only CME that features in the forecast is the pre-existing M2.0-associated CME from 02/1739UTC, however this is subject to change given the weight of new emissions. Updates will follow.

Figure 2: visible satellite imagery of the evolution of three of the current five sunspot groups on the sun (the right images comprise two groups each).



Solar Wind / Geomagnetic Activity: The solar wind showed a resurgent fast wind regime in the period, possibly a transition between the expected 'coronal holes', or perhaps variation within one such feature.

The solar wind speed initially declined towards background, before increasing substantially to peak at elevated levels by the period's end. The number of particles in the wind started and ended the 24 hours in typical background territory, separated by a brief slightly elevated period. The magnetic field was highest at this same time, slightly elevated and aligned almost completely counter to Earth's field.

The net result of the above solar wind measures was resurgent geomagnetic activity, with a provisional peak of Minor Storm G1 in the 18-21 and 21-24UTC intervals.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be low, with further occasional common-class flares

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and a chance of moderate-class. No significant regions are expected to rotate onto or leave the sun through the period.

Solar Wind / Geomagnetic Activity: Note that there are numerous CME candidates undergoing assessment at present, and the forecast that follows may change.

There are otherwise two parts to the latest geomagnetic forecast: the current 'coronal hole' fast wind stream(s), and also a possible glance from a CME emitted on 02/1739UTC in relation to the moderate-class flare.

There remains a chance of G1/Minor Storm from the current high speed stream(s) on day one, Sunday 06 March, with this risk further bolstered as a result of the uncertain influence of the moderate class flare-associated CME. Activity should wane into the new working week, becoming most reliably quiet from Tuesday 08 March, but with the caveats of the unassessed CMEs.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	40	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X	No	1	1	1	1

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Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	2	2	2
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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